

Amendment and Response under 37 C.F.R. 1.116

Applicant: Mark Hirst, et al.

Serial No.: 10/685,322

Filed: October 14, 2003

Docket No.: 200309706-1

Title: IMAGE DEVICE COOLING SYSTEM

IN THE CLAIMS

Please cancel claims 1, 2, 7, 12, 16, 19, 24, 29, 34, 39, and 45 without prejudice.

Please amend claims 3, 8, 13, 20, 22, 25, 30, 35, 40, 44, and 46-47 as follows:

1. (Cancelled)

2. (Cancelled)

3. (Currently Amended) A cooling system in a print imaging device having an element that generates heat, the cooling system comprising:

a thermoelectric generator thermally coupled to the element to convert heat from the element to electrical energy, wherein a first surface of the thermoelectric generator is mechanically coupled and thermally coupled to a housing of the imaging device and a second surface is thermally coupled only to the element to thereby allow removal of the element from the imaging device;

a cooling device powered by the electrical energy to thereby cool the print imaging device; and

a controller adapted to receive and configured to monitor a level of electrical energy from a power supply internal to the imaging device, configured to receive the electrical energy from the thermoelectric generator, and configured to cause the cooling device to be normally powered by the electrical energy from the power supply and to be alternately powered by the electrical energy from the thermoelectric generator upon detecting the level of electrical energy from the power supply is substantially at or below a threshold level.

4. (Original) The cooling system of claim 3, wherein the threshold level is substantially equal to zero.

5. (Original) The cooling system of claim 3, wherein the controller is further configured to cause the cooling device to be alternately powered by the electrical energy from the

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thermoelectric generator upon detecting that electrical energy from the thermoelectric generator is at a level greater than the level of electrical energy from the power supply.

6. (Previously Presented) The cooling system of claim 3, wherein the thermoelectric generator comprises:

a Peltier device operating in a Seebeck mode.

7. (Cancelled)

8. (Currently Amended) The cooling system of claim 73, wherein a heat conducting elastomer has a first major surface adhered to the second surface of the thermoelectric generator and a second major surface that contacts the ~~print~~-element.

9. (Previously Presented) The cooling system of claim 3, wherein the electrical energy comprises a voltage.

10. (Previously Presented) The cooling system of claim 3, wherein the cooling device is configured to reduce the temperature of the element.

11. (Previously Presented) The cooling system of claim 3, wherein the cooling device comprises at least one exhaust fan to generate an air flow.

12. (Cancelled)

13. (Currently Amended) A print imaging system comprising:

a heat source;

a cooling system comprising:

a thermoelectric generator thermally coupled to the heat source to convert heat from the heat source to electrical energy, wherein a first surface of the thermoelectric generator is mechanically coupled and thermally coupled to a housing of the print imaging system and a second surface is thermally coupled only to the heat source; and

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a cooling device powered by the electrical energy to thereby cool the print imaging system; and

a controller adapted to receive and configured to monitor a level of electrical energy from a power supply internal to the imaging system, configured to receive the electrical energy from the thermoelectric generator, and configured to cause the cooling device to be normally powered by the electrical energy from the power supply and to be alternately powered by the electrical energy from the thermoelectric generator upon detecting the level of electrical energy from the power supply is substantially at or below a threshold level.

14. (Original) The imaging system of claim 13, wherein the threshold level is substantially equal to zero.

15. (Original) The imaging system of claim 13, wherein the controller is further configured to cause the cooling device to be alternately powered by the electrical energy from the thermoelectric generator upon detecting that electrical energy from the thermoelectric generator is at a level greater than the level of electrical energy from the power supply.

16. (Cancelled)

17. (Previously Presented) The imaging system of claim 13, wherein the heat source comprises a print element.

18. (Previously Presented) The imaging system of claim 13, wherein the thermoelectric generator comprises:

a Peltier device operating in a Seebeck mode.

19. (Cancelled)

20. (Currently Amended) The imaging system of claim 4913, wherein a heat conducting elastomer has a first major surface adhered to the second surface of the thermoelectric generator and a second major surface that contacts the print elementheat source.

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21. (Previously Presented) The imaging system of claim 13, wherein the electrical energy comprises a voltage.

22. (Currently Amended) The imaging system of claim 13, wherein the cooling device is configured to reduce the temperature of the print elementheat source.

23. (Previously Presented) The imaging system of claim 13, wherein the cooling device comprises at least one exhaust fan that generates an air flow.

24. (Cancelled)

25. (Currently Amended) A laser printer comprising:

a fuser that generates heat;

a cooling system comprising:

a thermoelectric generator thermally coupled to the fuser to convert heat from the fuser to electrical energy, wherein the thermoelectric generator has a first surface mechanically coupled and thermally coupled to a housing of the laser printer and a second surface thermally coupled only to the fuser to thereby allow removal of the fuser from the laser printer; and

a cooling device powered by the electrical energy to thereby cool the laser printer; and

a controller adapted to receive and configured to monitor a level of electrical energy from a power supply internal to the laser printer, configured to receive the electrical energy from the thermoelectric generator, and configured to cause the cooling device to be normally powered by the electrical energy from the power supply and to be alternately powered by the electrical energy from the thermoelectric generator upon detecting the level of electrical energy from the power supply is substantially at or below a threshold level.

26. (Original) The laser printer of claim 25, wherein the threshold level is substantially equal to zero.

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27. (Original) The laser printer of claim 25, wherein the controller is further configured to cause the cooling device to be alternately powered by the electrical energy from the thermoelectric generator upon detecting that electrical energy from the thermoelectric generator is at a level greater than the level of electrical energy from the power supply.

28. (Previously Presented) The laser printer of claim 25, wherein the thermoelectric generator comprises:

a Peltier device operating in a Seebeck mode.

29. (Cancelled)

30. (Currently Amended) The laser printer of claim 2925, wherein a heat conducting elastomer has a first major surface adhered to the second surface of the thermoelectric generator and a second major surface that contacts the fuser.

31. (Previously Presented) The laser printer of claim 25, wherein the electrical energy comprises a voltage.

32. (Previously Presented) The laser printer of claim 25, wherein the cooling device is configured to reduce the temperature of the fuser.

33. (Previously Presented) The laser printer of claim 25, wherein the cooling device comprises at least one exhaust fan that generates an air flow.

34. (Cancelled)

35. (Currently Amended) A fuser system suitable for use with an imaging system, the fuser system comprising:

a fuser assembly that generates heat;

a cooling system comprising:

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a thermoelectric generator thermally coupled to the fuser assembly to convert heat from the fuser assembly to electrical energy, wherein the thermoelectric generator has a first surface mechanically coupled and thermally coupled to a housing of the imaging system and a second surface thermally coupled only to the fuser assembly to thereby allow removal of the fuser assembly from the fuse system; and

a cooling device powered by the electrical energy to thereby cool the fuser assembly; and

a controller adapted to receive and configured to monitor a level of electrical energy from a power supply, configured to receive the electrical energy from the thermoelectric generator, and configured to cause the cooling device to be normally powered by the electrical energy from the power supply and to be alternately powered by the electrical energy from the thermoelectric generator upon detecting the level of electrical energy from the power supply is substantially at or below a threshold level.

36. (Original) The fuser system of claim 35, wherein the threshold level is substantially equal to zero.

37. (Original) The fuser system of claim 35, wherein the controller is further configured to cause the cooling device to be alternately powered by the electrical energy from the thermoelectric generator upon detecting that electrical energy from the thermoelectric generator is at a level greater than the level of electrical energy from the power supply.

38. (Previously Presented) The fuser system of claim 35, wherein the thermoelectric generator comprises:

a Peltier device operating in a Seebeck mode.

39. (Cancelled)

40. (Currently Amended) The fuser system of claim 3935, wherein a heat conducting elastomer has a first major surface adhered to the second surface of the thermoelectric generator and a second major surface that contacts the fuser assembly.

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41. (Previously Presented) The fuser system of claim 35, wherein the electrical energy comprises a voltage.

42. (Previously Presented) The fuser system of claim 35, wherein the cooling device is configured to reduce the temperature of the fuser.

43. (Previously Presented) The fuser system of claim 35, wherein the cooling device comprises at least one exhaust fan that generates an air flow.

44. (Currently Amended) A method of cooling a print imaging device comprising:
~~converting heat generated by a print element of the imaging device to electrical energy;~~

positioning a thermoelectric generator so as to have a first surface thermally coupled to a print element and a second surface thermally coupled to a housing of the print imaging device, wherein the thermoelectric generator converts heat from the print element to electrical energy;

cooling the print imaging device with a cooling device;
monitoring a level of electrical energy provided by a power supply; and
powering the cooling device normally with the electrical energy from the power supply and alternately powering the cooling device with the electrical energy from the converting upon detecting a level of electrical energy from the power supply is at or below a threshold level.

45. (Cancelled)

46. (Currently Amended) The method of claim ~~45~~44, further comprising:

positioning the cooling device proximate to the print element to reduce the temperature of the print element.

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47. (Currently Amended) A cooling system in an imaging device having a print element that generates heat, the cooling system comprising:

means for converting heat generated by the print element to electrical energy;

means for both mechanically and thermally coupling the means for converting heat to a housing of the imaging device and for only thermally coupling the means for converting heat to the print element;

means for monitoring a level of electrical energy from a power supply; and

means for cooling the imaging device that is normally powered by the electrical energy from the power supply and alternately powered by the electrical energy from the heat converting means upon detecting a level of electrical energy from the power supply is at or below a threshold level.